L2 ANSWER 2 OF 4 CAPLUS COPYRIGHT 2003 ACS
AN 1995:733612 CAPLUS
DN 123:289556
TI Biodegradable bicomponent fibers and nonwoven fabrics containing them
IN Kitamura, Mamoru
PA Toyo Boseki, Japan
SO Jpn. Kokai Tokkyo Koho, 5 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
IC ICM D01F008-12
ICS A61F013-54; A47L013-16; A61F013-15; D01D005-34; D04H001-42; D04H001-54
CC 40-10 (Textiles and Fibers)
FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI JP 07133511	A2	19950523	JP 1993-281225	19931110 <--
PRAI JP 1993-281225		19931110		

AB The nonwoven fabrics contain side-by-side or core-sheath composite fibers having cores made from poly(lactic acid) and/or its mixt. with thermoplastic resins having m.p. .gtoreq.120.degree. and sheathes made from thermoplastics having m.p. .gtoreq.90.degree.. Thus, fibers comprising a poly(lactic acid)-based core and a lactic acid-.epsilon.-caprolactam copolymer-based sheath were cut and wet laid to give nonwoven webs.

ST biodegradability polyester fiber nonwoven fabric; polyamide nonwoven fabric biodegradability; polylactic acid fiber heat resistance; lactic acid copolymer bicomponent fiber

IT Polyester fibers, uses
RL: BAC (Biological activity or effector, except adverse); BSU (Biological study, unclassified); TEM (Technical or engineered material use); BIOL (Biological study); USES (Uses)
(bicomponent; biodegradable nonwoven fabrics contg.)

IT 26161-42-2, L-Lactic acid polymer sru 26811-96-1, L-Lactic acid homopolymer 80137-67-3
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(bicomponent fibers; biodegradable nonwoven fabrics contg.)

PATENT ABSTRACTS OF JAPAN

(11)Publication number : **07-133511**
(43)Date of publication of application : **23.05.1995**

(51)Int.CI. **D01F 8/12**
A61F 13/54
A47L 13/16
A61F 13/15
D01D 5/34
D04H 1/42
D04H 1/54

(21)Application number : **05-281225**
(22)Date of filing : **10.11.1993**

(71)Applicant : **TOYOBO CO LTD**
(72)Inventor : **KITAMURA MAMORU**

(54) BIODEGRADABLE CONJUGATE YARN AND NONWOVEN FABRIC USING THE SAME

(57)Abstract:
PURPOSE: To obtain biodegradable conjugate yarn and nonwoven fabric having excellent heat resistance and no fear of environmental destruction due to gradual biodegradation leading to final disappearance in being allowed to stand in the natural environment.
CONSTITUTION: This biodegradable conjugate yarn and nonwoven fabric comprise core-sheath type or side-by-side type conjugate yarn composed of polylactic acid and/or a thermoplastic resin (a) consisting essentially of polylactic acid, having ≥120°C melting point and a thermoplastic resin (b) having a melting point ≥30°C lower than that of the thermoplastic resin (a) and ≥90°C melting point. The core component is the thermoplastic resin (a) and the sheath component is the thermoplastic resin (b).

LEGAL STATUS

[Date of request for examination] 08.11.2000
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

* NOTICES *

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The biodegradability bicomponent fiber which the melting point is lower than the thermoplastics (a) and this thermoplastics (a) of 120 degrees C or more of melting points which make a polylactic acid and/or a polylactic acid a subject 30 degrees C or more, consists of thermoplastics (b) whose melting point is 90 degrees C or more, and is characterized by being the sheath-core type or parallel-connected-type bicomponent fiber whose sheath component a heart component is thermoplastics (a) and is thermoplastics (b).
[Claim 2] The biodegradability bicomponent fiber according to claim 1 whose aforementioned thermoplastic fiber (b) is thermoplastic fiber which makes a polylactic acid a subject.
[Claim 3] The biodegradability nonwoven fabric using the biodegradability bicomponent fiber of a claim 1 or a claim 2.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to a biodegradability nonwoven fabric or the nonwoven fabric using a biodegradability bicomponent fiber and it useful as biodegradability heat adhesive property fiber.
[0002]
[Description of the Prior Art] Conventionally, synthetic fibers, such as polyester, a polyolefine, and a polyamide, are used for the fiber currently used for life materials, such as hygienic goods, such as industrial materials fiber used for agriculture, engineering works, and a fishery use, and a sanitary napkin, a diaper, and a steamed towel, a wiping cross. If left in the nature after use, since it will be hard to be decomposed, these fiber has produced various problems. Therefore, after use, these industrial materials, hygienic goods, life materials, etc. are buried in soil, or it is necessary to destroy by fire. However, when buried in soil, since biodegradability was low, the usage of the land had a limit. In order to solve such a problem, it is possible to use the material decomposed in a nature.
[0003] As biodegradability polymer, aliphatic polyester, such as a copolymer of the poly 3-hydroxy butyrate made by polysaccharide, such as a cellulose, a cellulosic, a chitin, and the Quito acid, protein, and the microorganism, 3-hydroxy butyrate, and 3 hydroxy barricade rate, poly glycolide, the poly lactide, and the poly caprolactone, is known.
[0004] Although the cotton of the cellulose system mainly used and the regenerated cellulose are cheap, since it is not thermoplasticity, if a binder is needed and a polyolefine, a polyester fiber, etc. are used as binder fiber, since it is hard to be decomposed, these fiber will pose a problem.
[0005] The copolymer of the poly 3-hydroxy butyrate made by the microorganism, 3-hydroxy butyrate, and 3 hydroxy barricade rate had the problem that it was expensive and a use was limited.
[0006] Although the poly caprolactone is comparatively cheap biodegradability polymer, since the melting point is as low as about 60 degrees C, when making a nonwoven fabric by the stream confounding and the paper-making method, it has the problem that drying temperature cannot be raised. Moreover, when the temperature of 60 degrees C was a summer in the nature, it is the temperature which may happen in a circulation stage, and had a problem in respect of thermal resistance.
[0007] Although the material which mixed starch in polyethylene as a cheap material is examined, in biodegradability, satisfactorily, it cannot go and the fiber of a uniform mechanical characteristic has not been obtained.
[0008]
[Problem(s) to be Solved by the Invention] In the conventional technology, it could not be comparatively cheap, and was not able to have practical use thermal resistance and intensity, and the component **** nonwoven fabric which does not have thermoplastic biodegradability fiber promptly decomposed completely by the microorganism, and is practical was not able to be obtained. In view of such a situation, this invention is comparatively cheap, and has practical use thermal resistance and intensity, and the nonwoven fabric using the thermoplastic biodegradability bicomponent fiber and it which are completely decomposed by the microorganism is offered.
[0009]
[Means for Solving the Problem] This invention persons were comparatively cheap, and had practical use thermal resistance and intensity, and as a result of inquiring wholeheartedly about the thermoplastic biodegradability bicomponent fiber completely decomposed by the microorganism, they came to solve the above-mentioned problem by making into a sheath-core type or a parallel-connected-type bicomponent fiber the thermoplastic fiber which makes a polylactic acid and/or a polylactic acid a subject. That is, this inventions are the main resolvability bicomponent fiber which the melting point is lower than the thermoplastics (a) and this thermoplastics (a) of 120 degrees C or more of melting points which make a polylactic acid and/or a polylactic acid a subject 30 degrees C or more, and becomes from the thermoplastics (b) whose melting point is 90 degrees C or more, and is characterized by being the sheath-core type or parallel-connected-type bicomponent fiber whose sheath component a heart component is thermoplastics (a) and is thermoplastics (b), and a nonwoven fabric using it.
[0010] this invention is explained in detail below. The viscosity average molecular weight of the thermoplastics which makes a subject the polylactic acid used in this invention and/or a polylactic acid is 5000 or more, and is 104 preferably. Shell 106 It is a thing. Intensity sufficient as fiber by less than 5000 is not obtained, but it is 106. If it surpasses, it becomes hyperviscosity at the time of spinning, and is not easy to be inferior [silk manufacture nature].
[0011] As the manufacture method of a polylactic acid, it can obtain by dehydration condensation of a lactic acid, or the ring

opening polymerization of the cyclic ester of a lactic acid. As thermoplastic fiber which makes a polylactic acid a subject, aliphatic carboxylic acids, such as dicarboxylic acids, such as glycols, such as alpha-oxy acid [, such as annular lactone, such as epsilon-caprolactone, alpha-hydroxybutyric acid an alpha-hydroxy isobutyric acid, and an alpha-hydroxy valeric acid,], ethylene glycol, 1, and 4-butanediol, a succinic acid, and sebacic acid, a lauric acid, and stearin acid, can use for a lactic acid a kind or the thing by which two or more sort copolymerization was carried out. The melting point is controllable by copolymerizing.

[0012] The melting point is lower than the thermoplastics (a) and this thermoplastics (a) of 120 degrees C or more of melting points which make a polylactic acid and/or a polylactic acid a subject 30 degrees C or more, and the biodegradability bicomponent fiber of this invention consists of thermoplastics (b) whose melting point is 90 degrees C or more, and is the sheath-core type or parallel-connected-type bicomponent fiber whose sheath component a heart component is thermoplastics (a) and is thermoplastics (b). In order to make a nonwoven fabric by the bicomponent fiber, to carry out heat adhesion and to maintain intensity, the melting point of thermoplastic fiber (a) needs a thing high 30 degrees C or more than the melting point of thermoplastics (b). Moreover, in case nonwoven fabric processing is carried out, a certain amount of thermal resistance is required. Usually, a dryness-after stream confounding process is needed, and in this case, if drying temperature is not about 100 degrees C, drying efficiency will become bad. Moreover, when the thermal stability of the product in circulation is taken into consideration, it may be kept in the place of about 80 degrees C of summers. As thermoplastics (b), 90 degrees C or more of melting points 100 degrees C or more are needed preferably. The thermal stability of a nonwoven fabric is not obtained as the melting point of thermoplastics (b) is less than 90 degrees C. If thermoplastics (b) is a biodegradability resin, the copolymer which is mainly concerned with aliphatic polyester, such as polyester which is not limited especially and consists of a dicarboxylic acid and a diol, and a polyglycol acid, and/or them can be used for it.

[0013] Melt spinning of the bicomponent fiber of this invention can be carried out by the conventional method, and it can be manufactured by extending. Although the temperature of melt spinning changes with composition and molecular weight of a bicomponent fiber, it is desirable to consider as 140-230 degrees C. the ** which is not rolled round once rolling round the line of thread by which melt spinning was carried out after water cooling or air cooling -- one step or two steps or more of hot-rolling growth -- or a cold stretch can be carried out Draw magnification needs to make it 1.5 or more times, in order to consider as 2.0 or more g/d of tensile strength. In the bicomponent fiber of this invention, a sheath-core compound ratio and a parallel-connected-type compound ratio are 10 / 90 - 90/10, and are 30 / 70 - 70/30 preferably. Any of a continuous glass fiber and a staple fiber are sufficient as the biodegradability bicomponent fiber of this invention, and it can be selected timely by the purpose of use.

[0014] The biodegradability bicomponent fiber of this invention can add mechanical crimp processing, before cutting. As mechanical crimp processing, the pushing heating reduction-gear method, the stuffing-box method, etc. can be used. The crimp processing method cannot be limited and a well-known method can be used for it. Opening dispersibility can be improved in case a web is formed with a card. the number of crimps -- 5 - 50 piece/-- it gives 10-30 pieces / 25mm preferably 25mm, and cuts to 20-60mm preferably [10-80mm of cut length] In this case, uniform filamentation will not be obtained if the number of crimps exceeds five pieces / 25mm. Moreover, it is 8% or more well preferably that there is a rate of a crimp at 5% or more. When it applies to a card that the rate of a crimp is less than 5%, a uniform web is not obtained and an of-condensation-and-rarefaction portion must not occur.

[0015] Moreover, the biodegradability compound staple fibers used in case a nonwoven fabric is made by the paper-making method are 1.0-3.0d preferably [0.5-5.0d of diameters of fiber], and are 3-15mm preferably [1-25mm of cut length]. When cut length is smaller than 1mm, paper making is difficult, and the diameter of fiber is larger than 5d, and if longer than 25mm, it becomes difficult and is not desirable [the diameter of fiber is smaller than 0.5d, and / obtaining a uniform nonwoven fabric by paper making].

[0016] In a biodegradability bicomponent fiber, card permeability, antistatic nature, convergence nature, and the dispersibility at the time of paper making are taken into consideration. Cation system surfactants, such as anion system surfactants, such as lauryl phosphate potassium salt, and quarternary ammonium salt, Nonion system surfactants, such as aliphatic higher alcohol and an ethyleneoxide addition product of a higher fatty acid, Polyalkylene GURIKORI, such as a polyethylene glycol and a polyethylene-glycol polypropylene-glycol block copolymer, silicone oils, such as dimethylpolysiloxane, a polyether denaturation silicone oil, and a high-class alkoxy denaturation silicone oil, -- a kind -- or two or more sorts can be given

[0017] A three-dimensions confounding can be carried out to the nonwoven fabric using the biodegradability bicomponent fiber of this invention with needle punch, a high-speed jet object, etc. By carrying out a three-dimensions confounding, powerful and abrasion resistance of a nonwoven fabric can be raised.

[0018] Thermocompression bonding of the nonwoven fabric by the biodegradability bicomponent fiber of this invention can be partially carried out by the heating embossing roll, and it can improve powerful and abrasion resistance. The adhesion method cannot be limited and a well-known method can be used for it. The area of the thermocompression bonding section is 8 - 30% preferably 5 to 50%. less than 5% is enough as the thermocompression bonding section for a nonwoven fabric -- if powerful and abrasion resistance cannot be given but it becomes large from 50%, feeling becomes hard and is not suitable for uses, such as a diaper, a sanitary napkin, and a wiping cross

[0019] inorganic substances, such as polymer, such as aliphatic polyester of others [bicomponent fiber / biodegradability / in this invention], such as the poly caprolactone, polyvinyl alcohol, a polyalkylene glycol, and a polyamino acid, talc, a calcium carbonate, a calcium sulfate, and a calcium chloride, starch, protein, a food additive, an antioxidant, etc. -- a kind -- or two or more sort proper quantity mixture can be carried out, and various mechanical characteristics, biodegradation properties, etc. can

be changed
[0020]
[Example] An example is given below and this invention is explained further. The tensile strength in an example is JIS. It measured according to L1015. The number of crimps and the degree of crimp are JIS. It measured according to L1015. The melting point was measured with DSC or the hot-platen melting point measurement machine. before dryness, the contraction at the time of hot air drying took the 20cm long and 20cm wide sample, and measured it after [dryness] length, and the side of three each, and it asked for it by several 1 About **********, the obtained fiber was laid underground into soil, three months after fiber was taken out, and the decomposition state was evaluated by viewing. When the configuration was lost, it was presupposed that biodegradability is good. Good and the usually bad thing three-stage estimated feeling.
[0021]
[Equation 1]
$$Y=\{(A1+A2+A3+B1+B2+B3)/(6\times20)\}\times100$$

[0022] However, Y:dry heat shrinkage, A1 and A2, the lengthwise length after A3:dryness, B1, B-2, B3: It is the longitudinal direction length after dryness.
[0023] example 1 viscosity-average-molecular-weight about 80,000 polylactic acid -- a heart component, and the lactic acid and epsilon-KAPURORAKUTAN copolymer of a viscosity average molecular weight 50,000 [about] (a mole-ratio lactic acid / epsilon-KAPURORAKUTAN =95/5) -- a sheath component -- carrying out -- the heart / sheath compound ratio -- 50/50 -- carrying out -- the spinning temperature of 185 degrees C -- spinning with a diameter of 0.3mm -- melt spinning was carried out by **** 800 m/min from the spinning nozzle which has 32 holes Once rolling round non-extended thread, it extended 2.5 times at 80 degrees C, and fiber with a single-yarn fineness of 1.8d was obtained. Moreover, after introducing into the pushing gear formula crimp finishing machine which warmed fiber with a single-yarn fineness [after extension] of 1.8d at 70 degrees C and giving a crimp, the oily medicine was given, and it cut into 51mm, and the staple fiber for cards was obtained. After using the staple fiber as the web of superintendent officer 50 g/m2 with a random webber, stream confounding processing was carried out, hot air drying was carried out at 100 degrees C, and the nonwoven fabric was obtained (example 1). Those physical properties are shown in Table 1.
[0024] the polylactic acid of example of comparison 1 lactic acid, and epsilon-caprolactone copolymer (mole-ratio lactic-acid / epsilon-caprolactone =95/5) viscosity average molecular weight 60,000 -- the spinning temperature of 140 degrees C -- spinning with a diameter of 0.3mm -- melt spinning was carried out by **** 800 m/min from the spinning nozzle which has 32 holes Once rolling round non-extended thread, it extended 2.2 times at 70 degrees C, and fiber with a single-yarn fineness of 2.0d was obtained. After introducing into the pushing gear formula crimp finishing machine which warmed fiber with a single-yarn fineness [after extension] of 2.0d at 70 degrees C and giving a crimp, the oily medicine was given, and it cut into 51mm, and the staple fiber for cards was obtained. It is the staple fiber by the random webber Superintendent officer 50 g/m2 After considering as a web, stream confounding processing was carried out, hot air drying was carried out at 100 degrees C, and the nonwoven fabric was obtained (example 1 of comparison). Those physical properties are shown in Table 1.
[0025] Let the polylactic acid of a heart component, and the lactic acid and epsilon-KAPURORAKUTAN copolymer (mole-ratio lactic-acid / epsilon-caprolactone =95/20) viscosity average molecular weight 50,000 be a heart component for the polylactic acid of example of comparison 2 lactic acid, and epsilon-KAPURORAKUTAN copolymer (mole-ratio lactic-acid / epsilon-caprolactone =95/5) viscosity average molecular weight 60,000. the heart / sheath compound ratio -- 50/50 -- carrying out -- the spinning temperature of 140 degrees C -- spinning with a diameter of 0.3mm -- melt spinning was carried out by **** 600 m/min from the spinning nozzle which has 32 holes Once rolling round non-extended thread, it extended 3.2 times at 60 degrees C, and fiber with a single-yarn fineness of 2.2d was obtained. After introducing into the pushing gear formula crimp finishing machine which warmed fiber with a single-yarn fineness [after extension] of 2.2d at 60 degrees C and giving a crimp, the oily medicine was given, and it cut into 51mm, and the staple fiber for cards was obtained. It is the staple fiber by the random webber Superintendent officer 50 g/m2 After considering as a web, stream confounding processing was carried out, hot air drying was carried out at 100 degrees C, and the nonwoven fabric was obtained (example 2 of comparison). Those physical properties are shown in Table 1.
[0026] conventional example 1 polypropylene (MI=60,230 degree C, 2.13kg) -- a heart component and a polyethylene (MI=60,160 degree-C, 2.13kg) sheath component -- carrying out -- the spinning temperature of 180 degrees C -- spinning with a diameter of 0.3mm -- melt spinning was carried out by **** 600 m/min from the spinning nozzle which has 32 holes Once rolling round non-extended thread, it extended 3.6 times at 60 degrees C, and fiber with a single-yarn fineness of 2.6d was obtained. After introducing into the pushing gear formula crimp finishing machine which warmed fiber with a single-yarn fineness [after extension] of 2.6d at 60 degrees C and giving a crimp, the oily medicine was given, and it cut into 51mm, and the staple fiber for cards was obtained. It is the staple fiber by the random webber Superintendent officer 50 g/m2 After considering as a web, stream confounding processing was carried out, hot air drying was carried out at 100 degrees C, and the nonwoven fabric was obtained (example 2 of comparison). Those physical properties are shown in Table 1.
[0027] The physical-properties value acquired in an example 1 and the examples 1, 2, and 3 of comparison, the rate of a thermal contraction, and the evaluation result of biodegradability are shown in Table 1.
[0028]
[Table 1]

		実施例1	比較例1	比較例2	従来例1
強度 (g/d)		3.5	2.2	2.0	3.2
融点 (℃)	芯成分	179.8 (DSC)	131.2 (DSC)	130.8 (DSC)	168.2 (DSC)
	鞘成分	130.8 (DSC)	−	83.5 (熱板式)	134.5 (DSC)
捲縮数 (コ/25mm)		18.2	16.6	17.0	17.8
捲縮率 (%)		12.8	10.5	11.6	12.8
繊維長 (mm)		51	51	51	51
乾熱収縮率 (%)		3.6	38.5	37.5	5.2
生分解性		良好	良好	良好	悪い
風合い		良好	悪い	悪い	良好

[0029] It has the biodegradability in which the biodegradability bicomponent fiber of this invention excelled Table 1, and good physical properties, and it turns out that it excels also in thermal resistance.
[0030]
[Effect of the Invention] The biodegradability bicomponent fiber of this invention has the outstanding biodegradability and good machine physical properties, and thermal resistance and its heat weld nature are good. Moreover, the nonwoven fabric using the biodegradability bicomponent fiber of this invention is suitable for life materials, such as a disposable diaper, a surface sheet of a sanitary napkin, and a wiping cross, agricultural materials, engineering-works materials, and garments materials, and has perfect biodegradability in a nature.

[Translation done.]